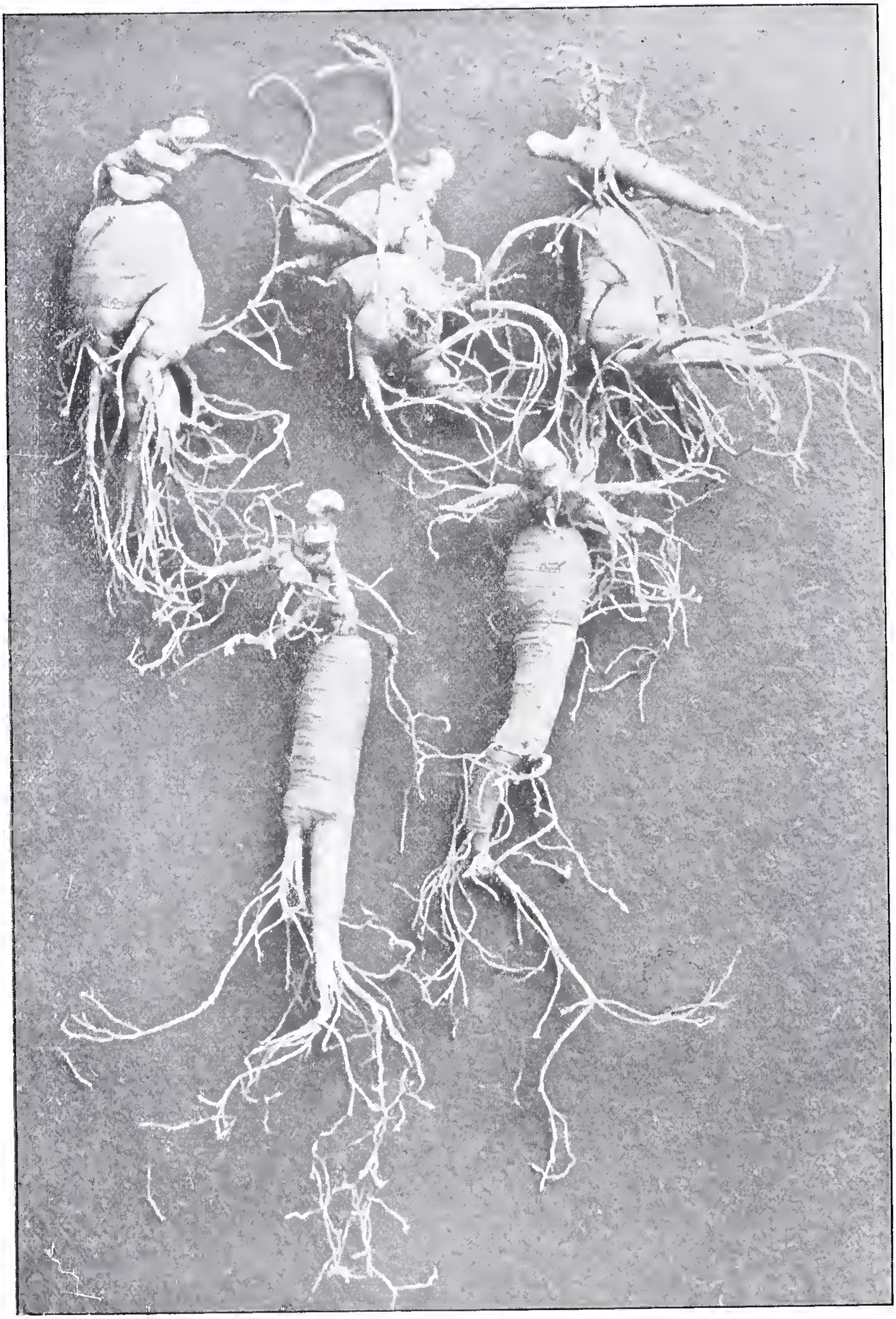


GINSENG.—Cultivated Roots Showing Fibrous Roots.

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF AGRICULTURE.

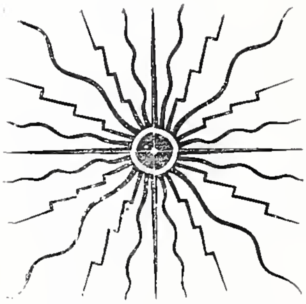
BULLETIN No. 27.
RE-PRINT.

THE CULTIVATION
— OF —
AMERICAN GINSENG
— IN —
PENNSYLVANIA.

By Prof. Geo. C. Butz.

PUBLISHED BY DIRECTION OF THE SECRETARY.

WM. STANLEY RAY,
STATE PRINTER OF PENNSYLVANIA.
1899.



COMMONWEALTH OF PENNSYLVANIA,
OFFICE DEPARTMENT OF AGRICULTURE,
HARRISBURG, PA., DECEMBER 1, 1897.

Under the provisions of section 6th of the act of March 13th, 1897, (to establish a Department of Agriculture and to define its duties and provide for its proper administration), the Secretary of Agriculture is authorized to order special investigations or examinations into subjects likely to prove of interest to the farmers of the State. Under this provision, a number of special examinations, by those fully competent to make reliable reports, have been ordered and others will be instituted.

In selecting the subject covered by this Bulletin it was believed that the following facts were deemed sufficient to warrant it:

First. That large amounts of ginseng are annually shipped from this country to China.

Second. That ginseng grows wild in some of the counties of our State.

Third. That its cultivation is possible and practicable in every county in Pennsylvania.

Fourth. That, if it can be profitably followed, the cultivation of ginseng will add another to the already large number of agricultural crops.

THOS. J. EDGE,
Secretary.

THE CULTIVATION OF AMERICAN GINSENG IN PENNSYLVANIA.

By Prof. GEO. C. BUTZ.

It is very probable that every county in Pennsylvania has been hunted over for ginseng and that now there are from two to twenty more or less active ginseng collectors in each county of this State. The practice of collecting the roots during the summer months before the crop of seed has ripened, and of taking every root in sight, however small, has very naturally resulted in greatly diminishing the quantity of wild root available for exportation; and, though the price per pound has steadily increased as the supply of root decreased, yet the profits to the collector have not been as great as formerly, owing to the greater difficulty in finding choice roots. In consequence of these conditions the attention of many collectors and other persons having favorable grounds is being directed toward the cultivation of ginseng, in the hope of more profitable returns from such efforts. Ginseng has been cultivated for many years in China and Korea, but in this country it has been within the past 15 years that earnest attempts have been made to cultivate our native species. Though some growers have claimed success in the cultivation of ginseng for five years or more, yet others who have attempted it testify by their experience that it is impossible to grow our ginseng to maturity with profit.

SOME EXTRACTS FROM THE CONTROVERSY.

In the "Druggists' Bulletin" for December, 1888, appears an interesting article upon the American Ginseng root, stating that the maximum export of 600,000 pounds was reached in 1860 and since this time has gradually diminished; that it is only a question of time when the ginseng will be exterminated, and that various attempts have been made to cultivate ginseng, especially in New York, Pennsylvania and Wisconsin, but no satisfactory results have yet been reached.

In the "American Agriculturist" for December, 1890, p. 645, Mr. A. S. Fuller, writing upon the cultivation of ginseng, gives excellent directions for forest beds, and says:

"It appears to thrive best in loamy soils, such as are usually found in sugar maple and oak forests at the North. Shade seems also to be essential, for when the plants are exposed to the direct rays of the sun they die out, and for this reason open field or garden cultivation of the plants has rarely or never been attended with success. The proper way to start a plantation is to select a piece of land at the edge of some forest where the plants are found growing wild."

Mr. L. Greenlee, of Garden City, North Carolina, writes in the American Garden, Vol. 12, p. 381, 1891, making the following statements:

"The great demand and high prices paid for dry roots of our little native plant (Ginseng), have led to much inquiry concerning its cultivation and history * * * It grows in loamy soils along elevated plateaus, or near the sea level in Northern states. With us it is peculiar to mountain sections, and so far has not proved amenable to culture."

In "Garden & Forest," Vol. V, p. 223, 1892, Geo. Stanton, of Summit Station, Onondago county, N. Y., first declared his success in the cultivation of ginseng in the following manner:

"It is the general opinion in this country that the plant cannot be successfully cultivated. In 1891, while attending the State fair at Syracuse with an exhibit of Ginseng, I was told by more than a hundred people that they had tried to cultivate the plant by setting roots and sowing the seed, but that they never grew. And this was my own experience at first. My first sowing of seed did not produce a plant. Two hundred roots which I put into the ground in 1886 made little growth the first year, and the outlook was so unfavorable that I abandoned the business. In 1887, I put in some roots and sowed some seeds, and the next year my plants made a better showing. I then commenced to study the habits and characteristics of the plant, and, with the experience gained, my success has been complete. I had thousands of fine plants growing on my ground in 1891. Many roots can be grown in a small place, and although the growth on each during the season is small, yet the aggregate is considerable. The plant will grow much more rapidly under cultivation than it will wild, and it therefore seems destined to become an important agricultural product * * * There is a general impression that our Ginseng may be grown in the forest, but that it cannot be successfully cultivated in the open garden or field. Of course, the forest is the natural home, and when it is once established in the woods it will require but little care or attention * * * My own operations have been in the open garden. Small roots may be set three inches each way, and seed may be started much closer and transplanted in two or three years. Experience will show the best method of shading. I have found that shade of some kind is essential. All that is needed then is weeding and careful cultivation * * * Of course there is much to be learned as to the best method of planting and cultivation, but the cultivated root is firmer and shrinks less in drying than the wild article. In my opinion, the growing of the plant can be made profitable, even if the root does not bring more than $2.00 a pound."

Efforts have been made from time to time to establish the Corean Ginseng plant at the Royal Gardens at Kew. In 1892 some seeds were obtained with great difficulty by Walter C. Hillier, Her Majesty's Consul General in Corea, from the large Government Gardens at Songdo, and sent to the Kew Gardens with the following hints as to cultivation, gleaned from the Coreans: "The seeds are sown in the spring in beds of fine leaf mould, no manure being used. The beds are raised about a foot and a half, are protected from the north winds, and screened at night with mats, an awning of mats being placed over the beds during the fierce heat of summer. At the end of the first year the plants are set out, and it takes five or six years for them to reach maturity."

In 1893, Mr. Greenlee, previously cited, wrote that in North Carolina ginseng "is now being successfully cultivated in the edges of forests partially cleared."

At the close of 1894 the U. S. Department of Agriculture published a bulletin (No. 16, Division of Botany), summing up the history and cultivation of American ginseng, by Geo. V. Nash.

Prof. F. V. Coville, botanist, in his letter of transmittal, says:

> "The report points out the fact that the natural supply is now rapidly decreasing, and that its extermination, if present conditions continue, is inevitable. At the same time there can be no question but that the cultivation of Ginseng is entirely practicable, and this information on the subject of cultivating the plant is therefore submitted to those interested. The ultimate success of Ginseng culture must, however, depend upon the result of a commercial test, having in view the possibility of overstocking the market through a widely increased source of production."

Many persons seem to have undertaken the cultivation of the plant with brief instructions and no experience, and perhaps lacking the necessary patience, but most of them have failed in their first attempt and occasionally have reported through periodicals that it is impracticable to grow ginseng for a crop. To show that success can be and has been attained the following figures, which appeared in "American Gardening" in February, 1896, are cited. They show the value of a ginseng garden after eight years of successful culture by Geo. Stanton:

"Up to autumn of 1888 I had only about 250 plants growing in my garden. I have now (January, 1896,) 67 beds,

30 beds 3 x16 feet, each,
37 beds 3½x16 feet, each,

stocked with roots in garden, and about 15,000 seedling roots in forest nursery. Also about 10,000 seeds sown in forest beds, from which plants are expected next spring. And this past season's crop of seeds, about 200,000, on hand, ready to be sown next fall to produce plants in spring of 1897. I have also, during the past five years, furnished the public with about 80,000 seeds and 4,333 roots for cultivation. The total product of dry marketable root from my ground up to the present time has been 84½ pounds, which sold for $405.88. I sold 28 pounds of the past season's crop at $5.50 a pound. The total cash product from seven and a half beds, 3x16 feet, taken up last fall was:

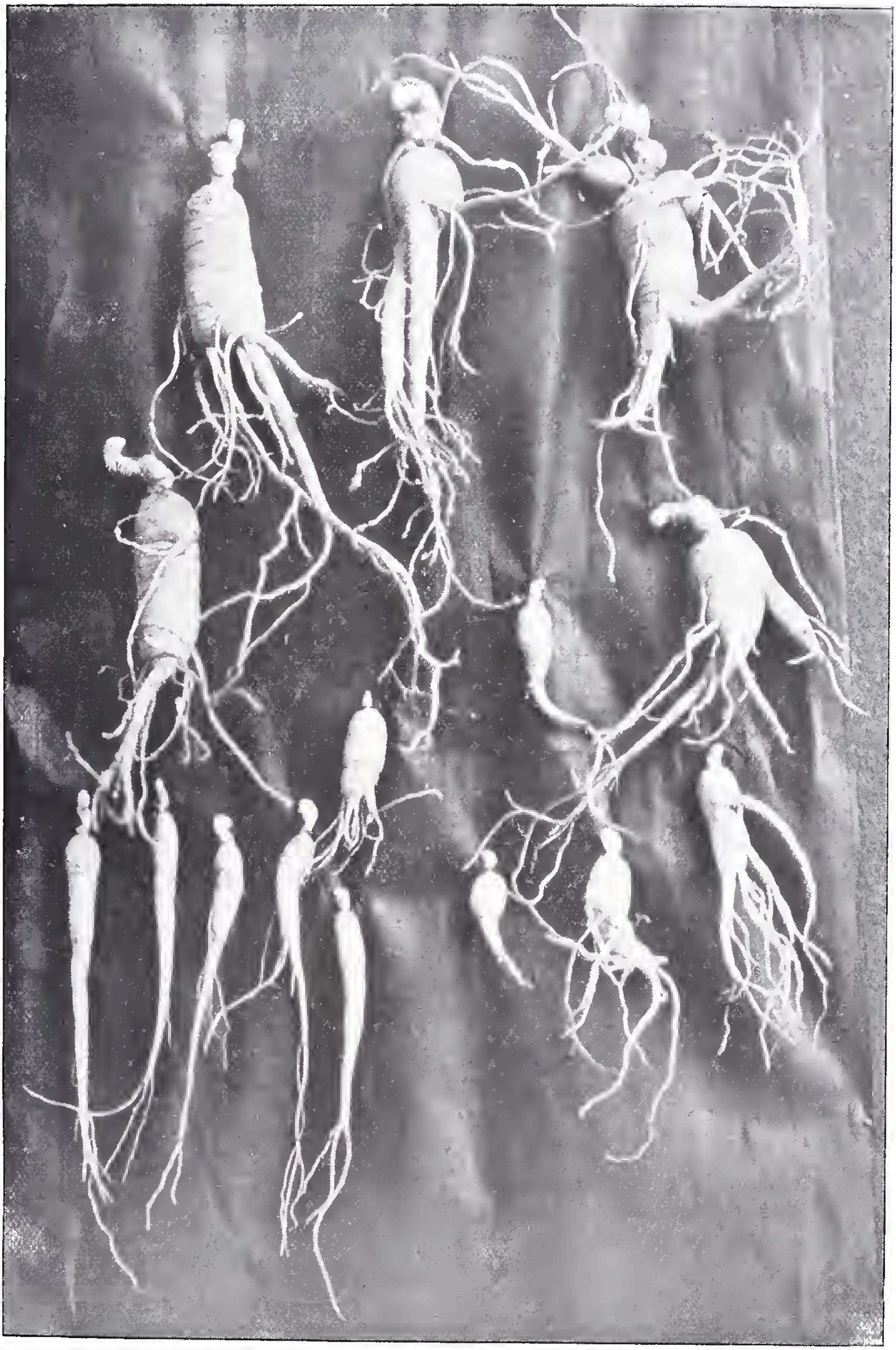
For dried root, ...	$186 00
The value of 4,232 roots for replanting, ...	126 96
The value of seed crop for four years, ...	75 00
Total value, ...	$387 96

This is for less than two square rods of ground in less than five years, four beds having been in cultivation five years, the others four years. * * * * The price for the past few years has ranged from $3 to $4 per pound for first class wild root in New York."

The writer visited Mr. Stanton's ginseng garden and his forest nursery beds in August, 1897, and witnessed the present condition of his stock. The seed beds were a charming sight because of the very uniform size and healthy color of over 100,000 seedlings from the sowing of the previous fall, proving conclusively to the writer's mind that ginseng plants can be successfully grown from seed. In other beds of the forest were plants two and three years old in good condition. In the garden plot the beds referred to above were covered with a luxuriant growth of ginseng plants with stems more vigorous than can be found in the wild state and bearing heavy heads of fruit.

What is Ginseng?

Ginseng, in this country, is a native perennial plant having a thick, fleshy root somewhat resembling a carrot. In the Southern states the common name has been corrupted and contracted into "sang," and in the North to "sheng." Lindley, in "The Vegetable Kingdom," gives the spelling as ginseng or ginschen. The American ginseng is *Panax quinquefolium*, L. Botanists have not agreed upon a specific distinction between the American and Chinese plants. Lindley says of the Chinese plant that it "belongs to some species of Panax (*P. Ginsing*, MEYER), unknown. It was formerly supposed to belong to *Panax quinquefolium* but that seems to have been a mistake; the species so named is said, however, to be sold by the Americans to the Chinese as a substitute for their ginseng." Hooker refers the Chinese plant to *Panax Ginseng*. London's Encyclopedia of Plants says: "*P. quinquefolium* is a native of Chinese Tartary and also of North America."



GINSENG.—Cultivated Roots, 2, 3 and 4 years old.

Gray follows Decaisne and Planchon in the use of the name *Aralia quinquefolia*, for the American plant. A note in the *Official Guide* to the Museums of Economic Botany at Kew, p. 87, concerning ginseng is as follows: "Ginseng—The root of *Aralia quinquefolia* A. Gray, Var. ginseng, Reg. et Maack, is a native of North China."

Britton & Brown, in "Illustrated Flora," 1897, refer it back to the older name Panax quinquefolium. Dr. Britton writes me the Chinese plant is recognized as a distinct species under the name P. Schinseng, Nees.

Prof. S. C. Sargent, in his notes on the Forest Flora of Japan, regards the Chinese plant as *Aralia quinquefolia* and as being identical with the American plant. He says: "Aralia is more multiplied in species in Eastern America, where six are known, than in Japan, whose flora contains only two, although a third, the ginseng (*Aralia quinquefolia*), a native of Manchuria, Northern China, and the United States, has been cultivated for centuries in Japan for the roots, which the Chinese esteem for medicine and buy in large quantities, sometimes paying fabulous prices for them, especially for the wild Manchurian roots, which are considered more valuable than those obtained from North America or from plants cultivated in Japan or Corea, where ginseng cultivation is one of the most important branches of agriculture."

DESCRIPTION OF THE PLANT.

Panax quinquefolium belongs to the small order of *Araliaceae* or ginseng family of plants, in which are included the common wild sarsaparilla, spikenard and the groundnut or dwarf ginseng. There is considerable resemblance between members of this family and such plants as the carrot and parsnip, in the thickened roots, flowers in umbels, and compound leaves.

The seedling plant has three simple leaves in a whorl at the top of a stem rising one to two inches above ground. The mature or fruiting plant throws up its single stem 8 to 15 inches, about as thick as a lead pencil. At the top are three, four or five compound leaves in a whorl, each resembling a leaf of the horse chestnut. The number of leaflets is usually five, hence the specific name *quinquefolium*, but on young or weak plants it may be only three, and on old or vigorous plants it is often seven. The two leaflets at the base of the digitate arrangement are about two inches long, but the rest of the leaflets are 4 to 7 inches long. They are egg-shape, with broad end farthest from the stem, with serrated margins and an acuminate apex, all of which is well illustrated in the annexed cut. From the centre of the whorl of leaves the stem of the plant is continued upward as an erect flower stalk from two to eight inches long, according to the thriftiness of the plant, and in July it bears a cluster of from 10 to 50 small yellowish green flowers arranged in an umbel. These flowers are succeeded by fruits like flattened berries of a green color until August, when they become consecutively purple, red and finally scarlet when fully ripe about September first. The berries are about the size of peas and contain two or sometimes three seeds; the pulp of the berry is edible, tasting somewhat like the root.

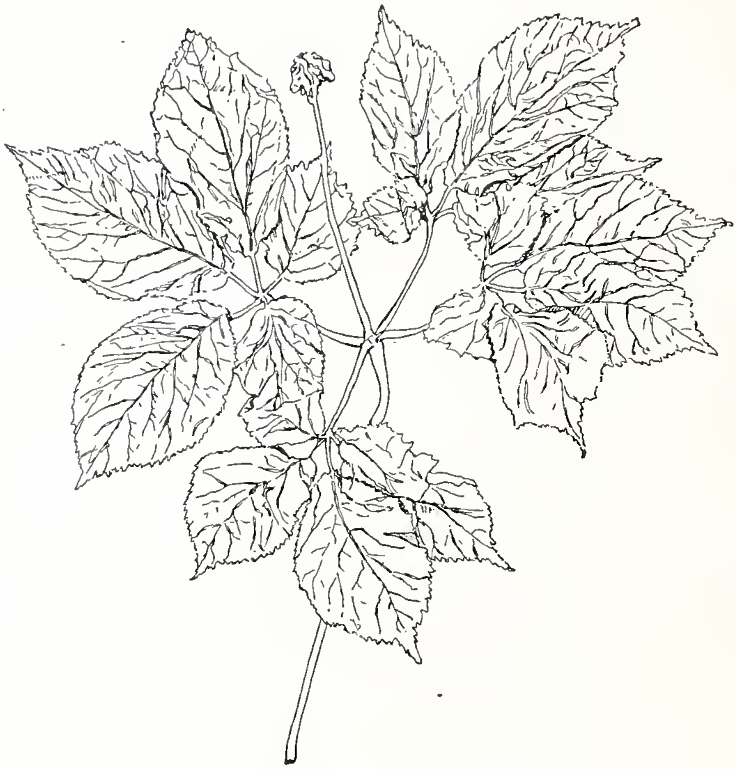


Fig. 1.—A strong Wild Plant; (Portion above ground).

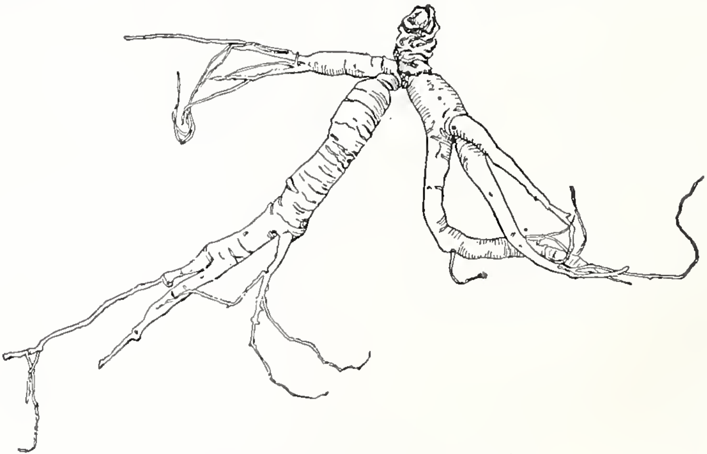


Fig. 2.—Fresh Wild Root.

The entire growth of the plant above ground is annual, while the underground portion is perennial. The portion underground consists of two parts, the rootstock or rhizome, and the root proper. The rootstock is slender, not fleshy, bearing the scars of the previous year's annual growth. Each scar, therefore, represents a year in the age of the plant. At Mr. Geo. Stanton's place the writer saw dried rootstocks which had been gathered in the forests, bearing 65 such scars, though the root appended was no larger than one's little finger. Roots, however, may be as large as they are known to occur and yet bear upon their rootstock not more than 8 or 10 scars.

The original root of the plant is at the base of the rootstock, but roots may be produced in after years from points higher up on the rootstocks, as in Fig. 2.

Mr. Chas. C. Lindley, of North Carolina, reports ("American Gardening," February 22, 1896), that the crown (rhizome) of the plant cut off one inch long and planted again, produced seed the next season.

The root proper is the part which has commercial value. The seedling roots, resemble small parsnips, being long, cone shaped, fleshy, white roots, free from branches or rootlets, except at the very base. It is common to find roots forked at the middle, giving an appearance that is suggestive of the human body with legs attached, and rarely specimens with arms in addition, as in Fig. 3, are found. It is this man-like form that is regarded by the Chinese with a sort of reverence and is said to be "worth its weight in gold." The name ginseng signifies "man-plant," and is applied because of the frequency of these forked roots and their fancied resemblance to the human form. Under cultivation, the roots being transplanted several times, become shorter and thicker, with many fibrous roots to feed, thus hastening the enlargement of the body of the root. The size of the roots collected varies in length from 3 inches to 12 inches; in diameter at the thickest part from one-fourth to one and one-half inches, and in weight for one-eighth of an ounce to eight ounces. The very large roots, however, are now exceedingly rare. The root is marked with transverse wrinkles when fresh; the dried root shows longitudinal wrinkles, due to shrinkage, Fig. 4.

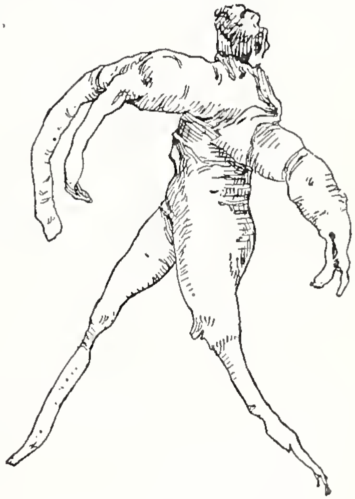


Fig. 3.—Wild root (human form).

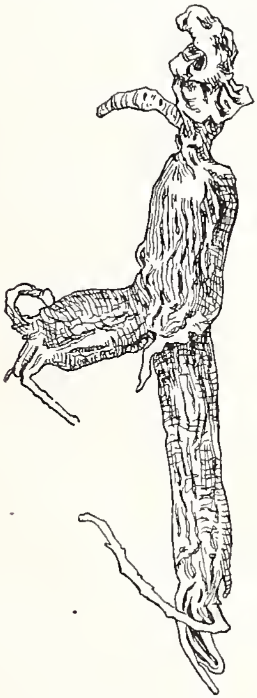


Fig. 4.—Wild Root (Dried)

The new growth of spring does not makes its appearance above ground in Pennsylvania until the last week in April, and one month later the whole leaf system is fully expanded. The flowers open in June and July, and the berries are ripe by the middle of August. The only method by which ginseng can be propagated is by seed. Therefore it is plain to be seen how effective is the prevailing custom of gathering roots in the summer before the seed crop has ripened, in diminishing the annual exportation.

The American ginseng is found growing in this country over a triangle of territory with its angles in the States of Maine, Minnesota and Alabama, confining itself, however, to the mountainous portions of the states south of Pennsylvania. It was first discovered near Montreal, Canada. in 1716, by Father Laftau, a missionary among the Iriquois Indians. About this time Father Jartoux, a missionary in China sent a description of the Chinese plant to Europe and an eager search was made in other countries for a ginseng plant, resulting in the discovery in Canada. The French soon after began collecting it for export to China, and, according to the researches of Geo. V. Nash (Bulletin 16, Div. Bot., U. S. Dept. Agr.), "In 1750 it was found in the western parts of New England generally, and in 1751 it was discovered in central New York, and at Stockbridge, Mass. It was found plentifully in Vermont at the time of the settlement of that State, and the parties who dug the root sold it in its crude form for about 2 shillings, or 34 cents per pound. As population moved westward ginseng was met in abundance as far as the first tier of states beyond the Mississippi. An export trade was eventually developed which in Wisconsin was reported to have reached a value of $40,000 in 1858 and $80,000 in 1859." At present the chief sources of the plant in the states are Ohio, West Virginia and Minnesota.

Ginseng is now scarce in Canada and also in many of the states where it formerly abounded. Reports from collectors in Pensylvania indicate that it cannot be found in many of the particular places where it was formerly collected. It occurs mostly in hard wood forests, upon well drained soils, where beech, sugar maple and basswood abound.

The roots from the Northers states command higher prices than those from the Southern states. In a circular issued in August, 1897, by J. L. Cilley, an exporter of ginseng, located in New York city, No. 101 Gold street, the dried root from the several states were rated in prices which he advertised to pay as follows:

1.	New York, Northern Pennsylvania, Vermont and Canada, ...	$3 10—$3 20
2.	Southern Pennsylvania, Michigan, Northern Ohio, Northern Indiana and Western Illinois, ...	2 90— 3 00

3. Wisconsin, Iowa, Minnesota and Northwestern,	2 70— 2 80
4. West Virginia, Southern Ohio, Southern Indiana, Southern Illinois,	2 60— 2 75
5. Maryland, Virginia and North Carolina,	2 60— 2 70
6. Missouri, Arkansas,	2 60— 2 70
7. Alabama, Kentucky, Tennessee, Georgia,	2 50— 2 60

MEDICINAL PROPERTIES.

The American ginseng root has no medicinal value in the United States. It occurs in some of the editions of the U. S. Pharmacopoeia, but not in recent years, and has never really been used in American practice. It is also stated that it is not employed in the secret remedy industry, which consumes a large portion of our crude drugs. The Chinese, however, regard ginseng as a panacea, which fact is observed in the generic name of the plant (Panax). It is stated that one of the presents given Li Hung Chang, the distinguished Viceroy of the Chinese Empire, during his recent visit to New York, was a collection of ginseng roots, and it is doubtful whether anything he received pleased him more than this. That the price which the Chinaman will pay for the roots depends upon their shape, is an indication that the medicinal properties are more imaginary than real. Ginseng is used in China as a remedy for all weakness of body or mind; for pituitous humors, for weakness of the lungs, to stop vomiting, to strengthen the stomach and aid digestion, and it is believed that it prolongs life in old age.

The root has a slight aromatic taste, resembling that of the licorice root, and like it is somewhat demulcent and stimulative. The drug is prepared as an extract or a decoction, and administered in pills, confections or infusions. It does not seem probable that the Chinaman's faith in the efficacy of ginseng will wane for some time to come, and consequently the demand for the American root will continue steadfast. It was said by a traveler in China that he never entered a drug shop but ginseng was being sold.

COMMERCIAL VALUE.

The price paid for ginseng in this country has steadily increased from the first consignment made in the early part of the eighteenth century, on which exporters realized 34 cents per pound. In 1832 the shipment of ginseng from the United States amounted to 407,067 pounds, valued at $99,303. The extent of the industry in the United States since 1858 and the average price paid for the dried root at the ports are illustrated in the following table of figures taken from the Bulletin by G. V. Nash, with the addition of subsequent years.

Exports of Ginseng from the United States from 1858 to 1896.

Year.	Total pounds.	Average price per pound.	Total amount.
1858,	366,053	$0 52	$193,736
1859,	110,426	49	54,204
1860,	395,909	74	295,766
1861,	347,577	84	292,899
1862,	630,714	64	408,590
1863,	372,945	79	295,120
1864,	360,950	1 31	474,920
1865,	464,507	1 17	547,653
1866,	444,398	86	382,870
1867,	479,974	1 11	535,883
1868,	370,066	1 02	380,454
1869,	282,405	1 02	288,054
1870,	474,310	95	455,097
1871,	114,221	1 04	119,385
1872,	401,260	85	341,616
1873,	350,141	97	341,144
1874,	400,619	1 12	448,760
1875,	497,487	1 32	658,926
1876,	550,624	1 17	646,954
1877,	440,406	1 32	562,268
1878,	421,395	1 18	497,247
1879,	391,264	1 24	465,611
1880,	391,083	1 36	533,042
1881,	338,841	1 65	561,545
1882,	262,728	1 83	483,171
1883,	414,023	2 04	848,393
1884,	295,242	2 08	614,995
1885,	377,345	1 99	751,168
1886,	467,608	2 13	998,332
1887,	330,831	2 08	689,735
1888,	308,365	2 13	657,358
1889,	271,228	2 33	634,091
1890,	223,113	2 71	605,233
1891,	283,000	3 39	959,992
1892,	228,916	3 51	803,529
1893,	251,205	3 15	792,928
1894,	194,564	3 18	619,114
1895,	233,236	3 97	826,713
1896,	199,436	3 86	770,673
Total, 39 years,	13,738,415	$1 52	$20,837,169

This takes no account of the ginseng exported annually from Canada. The quantity sent out of that country in 1890 has been estimated as worth $100,000.

RECAPITULATION, SHOWING ADVANCE IN PRICE.

	Total amount.	Average price per pound.	Total pounds.
Exports for 10 years, 1858-1867, ...	3,973,453	$0 89	$3,481,641
Exports for 10 years, 1868-1877, ...	3,881,539	1 09	4,242,658
Exports for 10 years, 1878-1887, ...	3,690,360	1 75	6,443,239
Exports for 9 years, 1888-1896, ...	2,193,063	3 04	6,669,631

The perceptible increase in the price per pound indicates a growing market in which the supply is decidedly inadequate to the demand.

The American ginseng is not regarded by the Chinese as being as valuable as their own roots. Five grades of ginseng are described by I. F. Shephard in the United States Consular Reports, 1884.

First. "Imperial ginseng" is that raised or gathered under imperial protection in the parks or hunting grounds, where it is kept free from the profanation of the vulgar herd. It ranges from $40 to $200 per pound.

Second. Korean ginseng is regarded as second best in quality, and includes both the wild and cultivated root of that country. The price of this is $15 to $35 per pound.

Third. Native ginseng is that grown in China near the borders of Korea. It is valued at from $1 to $10 per pound.

Fourth. American ginseng stands next in the estimation of the Chinese; when crude it averages (1884) about $2 per pound.

Fifth. Japanese ginseng is the last and poorest quality. This and the "native ginseng" are used chiefly to adulterate the Korean article. It is valued from $1 to $10 per pound.

Since this classification was made, the demand for American ginseng has greatly increased in China.

The following is taken from the annual report of Consul Johnson, dated Amoy, China, July 29, 1897:

"I do not exaggerate when I state that it is possible to market annually in China $20,000,000 worth of these roots. They are now being cultivated in the United States to a limited extent, and prices obtained by the grower are entirely out of proportion to those realized by the thrifty exporter. It sells in Amoy at a price from $25 to $35 (Mexican) per pound. It costs in American from $2 to $3 in gold or $4 to $6 in Mexican currency. Yet at these figures Amoy handled, during 1896, 109,823 kaikwan teals' (or $88,517.34 in United States gold) worth of these roots from America alone. From Korea the value of 54,867 kaikwan teals, or $44,222.80 (United States gold), was imported. The Korean article is much higher priced and more skillfully cured, although not otherwise superior in quality to the American product."

Cultivation.

Since the earliest report of the success attained in the cultivation of the American ginseng by Mr. Geo. Stanton, who might be regarded as the pioneer in the movement to cultivate this remarkable plant in America, there have been many persons in the State of Pennsylvania who have attempted to follow in his footsteps. Not all have succeeded; perhaps because the necessary amount of attention was not bestowed upon the plants. One of the most successful cultivators in this State is Mr. N. B. Curstead, Oliphant Furnace, Pa. He has had plants under cultivation for 8 years, in a plot of ground about 10 feet by 50 feet, in the rear of his garden; a line of large native trees stands upon the southern border of the plot and the spreading branches shade the beds of ginseng all the day. Mr. Curstead has now in his bed many marketable roots and is making preparations for an extension of his plantings. Mr. A. B. Null, of Bonview, Lancaster county, Pa., has been a collector of ginseng for ten years and writes: "I have cultivated it four years and grow plants from seed for planting." Mr. Null has not yet planted extensively for a crop of roots but is growing and collecting stock to plant new beds.

Mr. James Galen, Bethesda, Lancaster county, has been a collector for many years, and being thoroughly acquainted with the habits of the ginseng plant, has succeeded in maintaining limited plantings in his garden.

Mr. Jno. O. Rosser, Mill Hall, Clinton county, Pa., obtained plants and instructions from Mr. Geo. Stanton in September, 1892, and writes, August 30, 1897, of his experience as follows: "In reply to your inquiry, would say that my experience has been limited and resources meagre, but four years ago I started with some 40 plants; from them I now have about 400. I would not hesitate to say that had I the means to prepare for ginseng culture, I would make it both profitable and pleasant. As yet I have endeavored only to increase the number of plants, but from surface indications believe that I have single roots that will weigh 4 ounces green."

Dr. James Johnston, of Bradford, Pa., teaches by his experience that ginseng cannot be grown without more or less constant care. He writes, under date of September 23, 1897: "We made a bed in an obscure corner on a side hill and planted seeds for two seasons (1891 and 1892). The first lot come up on time and promised well, but after that there were only a few desultory showings. My test was not a fair one because the beds were almost unattended and were exposed to unusual drouth in the third year, then to unusual rains in the fourth year, which washed earth down so as to cover them up completely. * * * I would be willing to try again, and think I shall try in my town garden this time and give it more care."

J. W. Drake, Saegertown, Crawford county, Pa., writes that with but two years' experience he is of the opinion that ginseng can be grown in this State with profit.

Mr. Geo. Stanton, of Summit Station, Onondago county, N. Y., has cultivated ginseng for 10 years. He has made a success of it, for in his grounds are the most thrifty and healthy plants by the thousands and tens of thousands of all sizes. He has made it profitable, as his carefully kept account of expenditures and receipts shows, although his beds have only recently begun to yield marketable roots. He discovered for himself, by his own experience, that it required 18 months for the seed to germinate. He has demonstrated that the plant can be grown in any garden with proper shading, and with patience and thought has worked out the most successful construction to provide such shade. Frequent reference to his work is made in these pages, though his ginseng farm lies somewhat beyond the border of Pennsylvania, in the State of New York. Mr. Stanton has chosen to call his place the "Chinese Ginseng Farm," but it is the true American species which he is cultivating for the Chinese market. He is very willing to receive visitors at his grounds and solicits correspondence upon the subject of ginseng.

PROPAGATION.

Ginseng plants can be multiplied only by means of seeds. These are taken from the plants when ripe in September; each berry contains two, sometimes three seeds. It requires 18 months for ginseng seed to germinate and during all that time it must not be allowed to dry. Therefore, it cannot be stored as vegetable seeds are in packages, but must be treated as most forest seeds are, by stratifying during the period of germination. Many failures with ginseng seed have occurred because of the lack of exact knowledge on this point. The seed may be sown as soon as ripe in beds prepared for them, but should be covered with muck, leaf-mold, or some kind of mulching to prevent baking or cracking of the soil. It is further advisable to place a lot of brush over the mulch until the spring when the seeds are expected to sprout.

The seed may be preserved during the first twelve months by stratification; that is, by mixing it with four times its bulk of well decayed leaf-mold, and storing in a small wooden box; or, by putting the leaf-mold one-half inch thick over the bottom of the box, then a single layer of seed, then another course over the first, alternating soil with seeds until the box is nearly full or the seed all stored. The box containing the seed must then be placed where it will not be neglected. It must be protected against mice and excessive drying. Mr. Stanton tacks over the top of the box a sheet of tin, perforated to admit rain. The box is then placed in a shaded place where it can remain all winter and summer.

The seed beds should be carefully prepared. The best place is in a forest where there are tall trees with little undergrowth and the soil is light, loose and rich. It should be carefully forked ten inches deep, removing all roots that would interfere with the growth of the young ginseng plants; all stones should be taken out. A liberal amount of leaf-mold may be used to give the desired looseness to the soil. If there is danger of flooding and washing in the spot chosen, the objection can be avoided by raising the seed beds, retaining the soil by boards 6 inches wide at the sides and ends, held in position by stakes. A convenient size for seed beds is 3x16 feet. A bed 3x4 feet is large enough for 1 ounce of seed. An ounce contains about 500 seeds. Sow the seed in drills one inch deep, making them two or three inches apart and dropping the seeds one inch apart in the drill. Forest beds must be protected against animals grazing and tramping over them. Cattle are very fond of the leaves of ginseng.

If a forest bed is not convenient, a seed bed can be made in an orchard or even the open garden, if satisfactory shading is provided. Shade is essential to ginseng throughout its whole period of growth.

After the seed is in the ground and covered, the bed will require no special care beyond that of keeping out weeds, never permitting them to interfere with the perfect development of the ginseng plants. Th seedlings are allowed to remain in the seed beds two or three years before transplanting into permanent beds.

Seeds are sometimes sown between the rows of plants in permanent beds, thus economizing space and shading, but the practice is not to be recommended for first class seedlings.

PERMANENT BEDS.

Permanent beds are prepared in the same manner as described for seed beds. The general condition of the soil should be somewhat firmer or closer than that recommended for seedlings. Some permanent beds in this State have too strong an admixture of leaf-mould to sustain vigor in the plants. There should be considerable body to the soil, as in a rich friable garden loam. If cultivators will examine carefully the condition and character of the soil in which vigorous ginseng plants are growing in their native haunts they will discover that the hand cannot be thrust down to the depth of the roots; neither is the soil a pure black mould, as some beds have unfortunately been made.

The permanent beds are planted with two or three year-old seedlings, or with small wild roots gathered from the forests. The latter, when near at hand, are more cheaply obtained than cultivated seedlings, but it is reasonable to believe that seedlings grown under conditions best suited to their rapid and uniform development, and provided with many fibrous roots, will transplant with less loss and resume growth with a more rapid pace than wild roots stunted by the various disadvantages which wild plants must endure, carrying a minimum of working rootlets. Occasionally very good wild roots can be found and of course should not be discarded.

In the permanent beds the plants are set from 4 to 6 inches apart each way, and are not again moved until ready for market. This will be in four or five years from transplanting, or six to eight years from seed. The handling of plants for transplanting is best done in September or October, although it may be performed successfully in early spring. The roots may be dibbled in or set in an opened furrow deep enough so that the last "scar," or rather the new bud for the next season's growth on the rootstock may be covered about two or three inches. There should be no cutting or trimming at the roots. After the roots are set in the permanent beds the most important consideration to success is proper shading, which must be provided before the warm days of spring arrive. To protect the roots in the ground during winter, a good mulch of forest leaves (or straw) and brush is thrown over them.

Artificial Shading.

Many of the failures in ginseng culture have resulted from the full exposure of the beds to direct sunlight or by shading in such a manner that free circulation of air was obstructed and the plants could not thrive. Mr. Stanton began by having lath screens over the beds just a little higher than the plants in them. The effect, however, was unsatisfactory and it was necessary to remove the screens whenever the beds required any work. His present arrangement, which he regards as the most successful manner of shading beds of ginseng in garden culture is illustrated in Fig. 8. It consists of a flat roof of lath screens raised high enough above ground to admit of easy walking underneath. It is much like a screen house built by florists and gardeners in which they summer potted plants which cannot endure the full sunlight.

Mr. Stanton's ginseng houses are constructed so that the entire roof can be removed at the approach of winter with its snow, and stored until spring. Only the supporting frame work remains standing. The uprights are 8 feet long, of 2x4 inch stuff, planted 2 feet in the ground, and stand 6 feet apart in rows which are 8 feet apart, admitting between them a bed of 3 feet wide on either side of a 15-inch walk. At the top these uprights are held in place by cross pieces of 1x3 inch stuff running in two directions. On these cross pieces the screens of lath rest and are made fast to prevent their being disturbed by severe winds. Ordinary plaster lath may be used for the screens, leaving five-eighth inch space between the lath. The sides of the enclosure are also of screens to the height of three feet, thus leaving the upper half of all the sides open, whereby the free circulation of air may take place. According to Geo. V. Nash, a ginseng grower of Somerset, Ky., Mr. J. W. Sears, planted permanent beds in a "rich north hillside, well timbered," and "in the spring frames are placed over them on which a lot of brush is thrown," thus providing a cheap shading, though less perfect.

The height of the brush above the plants is an important item, but is not stated.

Treatment of the Beds.

The beds, when planted and shaded, require but little attention, aside from the weeding during summer, and being on the lookout for the enemies of the plant. Snails and some insects attack the young plant to some extent. Some roots are injured by worms. Field mice or ground moles have been suspected of eating off the young roots of seedlings in forest beds, and some evidence of a foungous disease causing a decay of maturing roots has attracted some attention. Experience has been too brief to determine whether these annoyances will be constant or prove to be only incidental.

In the month of September the seed crop is harvested and stored, and at the approach of heavy snows the shading screens are stored for winter. What use might be profitably made with fertilizers has not been made a matter of experiment in this country, except to employ well rotted horse manure instead of leaf-mould in the preparation of permanent beds.

The Cultivated Root.

Under cultivation the roots of ginseng develop more fibrous roots, which serve to mature the tap roots in the fewest possible years. Six to eight years from seed will make the choicest roots, or four to five years from two or three year old seedlings transplanted. Mr. Stanton marketed his first roots in 1893, and sold the crop of 16½ pounds to T. A. Bronson, of New York, at $4.00 per pound, or 50 cents per pound more than the wild root was sold for at that time, and received in reply from Mr. Bronson that he would like 1,000 pounds of such roots. These roots, 241 in number, averaged in weight, when fresh, 3½ ounces, and the largest of them weighed 6½ ounces. Such roots are rarely found now among the collection of wild root. In 1895, Mr. Stanton received $5.50 per pound for his cultivated root.

Valuable pioneer work can be done to establish a strain of ginseng that will be noted for its large fleshy roots developed in the minimum of time. The seed from the largest and best roots should be kept separate from the general crop and sown where they could receive special care and treatment, and when the plants reach maturity repeat the careful selection of seed and thus continue through several generations or until a distinct strain of plants is established. The history of the cultivated carrot and other fleshy rooted vegetables of cultivation indicates that a similar selection has been going on, though less persistently, to bring about the great differences between the cultivated and native forms.

Preparation of the Root.

After the roots are carefully taken out of the ground they should be washed clean with water and a broom or brush. No previous trimming of rootlets or rootstocks is necessary, for after drying the small roots are broken off in the handling and the rootstock serves to indicate the age and possesses the same qualities as the root. In fact, mutilated roots, or such as have been cut or sliced to hasten drying, are rated inferior to whole roots. When the roots are thoroughly cleansed, they are dried by laying them out loosely over a tray or trays exposed to the sun, or subjected to a moderate artificial heat. There is danger of scalding or burning them and this should be avoided. The quicker the drying is effected, the better will be the appearance of the root. It requires ordinarily about one month to be completely dried, and during this process the root loses about two-thirds of its weight, three pounds of resh root making one pound of dried root. It is said that roots gathered in the summer lose three-fourths of their original weight in drying, although in several trials with roots gathered on July 3, 1897, the shrinkage was just about two-thirds. The cultivated root does not shrink so much. Three native roots collected July 3 were weighed at intervals during the process of drying, which was conducted in the sun, and gave the following figures, the weights being in grammes:

	Root 1.	Root 2.	Root 3.
July 3, fresh,	63	32.5	15.7
July 6,	45.7	22.7	11.4
July 10,	32.3	13.6	7
July 19,	23.1	12.1	6.2
July 29,	21	11.8	6.1
August 5,	20.9	11.7	6.1

When roots are thoroughly dry they are placed in paper sacks or clean boxes and kept away from dust until a shipment can be made to the wholesale buyer.

Protection of the Wild Root.

The collecting of the native ginseng is a sort of pilfering that has seldom been prohibited by the owners of the forests in which the roots are gathered. Nicolas Pike, in an interesting article on ginseng (Scientific American, January 10, 1891), writes that in New York, back of the Catskills, is a forest extending over twenty miles, and there ginseng grows in great abundance, and thousands of pounds are yearly gathered by the poor people of the county, that the "whole population in the neighborhood, men, women and children, turn out 'ginsening,' as they term it."

In view of the rapid extermination of the root, a few states have enacted laws limiting the time of collecting, so that all seeds would have ripened before the plants are disturbed. Such laws, however, are difficult to enforce, and yet they direct the attention of thoughtful men to the wasteful method of collecting now in vogue.

In Virginia, as early as 1875, the Legislature enacted: "If any person shall dig any ginseng from the fifteenth day of March till the 15th day of September, such person, on conviction before a justice of the peace, shall be fined not less than five nor more than ten dollars and costs for each offense." The informant is entitled to one-half the fine, the remaining half going to the Commonwealth.

Ontario, Canada, has a similar law since 1891, making the period of restriction from January 1 to September 1.

West Virginia has a law to protect, as above, the ginseng and other medicinal roots, dated 1873.

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